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ABSTRACT

A group test and individual interviews were used to investigate quantitative and qualitative aspects of students' vocabularies. Subjects for the group test were 144 high-, middle-, and low-ability fourth and sixth graders. Subjects for the interviews were eight high- and low-ability third and fifth graders. The group test consisted of two forms of a 36-item, multiple-choice test comprised of words at various difficulty levels. Subjects received one form of the test as a reading test and the other as a listening test in a counterbalanced fashion. The interviews required subjects to give two meanings for words in isolation, identify two meanings of words presented in two contexts, and distinguish between the meanings of closely related words. An analysis of variance on the group test indicated significant differences due to grade, ability, mode, and word difficulty. However, the difference due to mode was small for both good and poor readers. On the interviews, students did best at identifying multiple meanings in context, and giving multiple meanings for isolated words best distinguished good and poor readers. These and other results are discussed. (Author/GK)

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This paper was prepared for
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A Quantitative and Qualitative Study of Students' Vocabularies

Michael F. Graves

University of Minnesota

The study described here investigates the relative size of the reading and listening vocabularies of readers of two ages and, to some extent at least, varying levels of ability. The study also investigates several aspects of what has been termed the depth of students' understanding of words. Additionally, the study provides some information about the effectiveness of two word lists in identifying words that students do and don't know. The study is primarily motivated by two concerns, one of which is more theoretical and the other of which is more practical.

The more theoretical concern is the question of how, to what extent, and with what results the vocabularies of students of varying ages and ability levels differ. Motivation for this question stems primarily from the debate between those who argue for the primacy of words (for example, Whorf, 1956), those who argue for the primacy of thoughts or concepts (for example, Vygotsky, 1962), and those who take the more conservative view that words encourage the development of concepts (for example,

Bowerman, 1977). Theoretical interest is further motivated by what Anderson and Freebody (1979) have recently suggested are three hypotheses that might explain the strong relationship repeatedly found between vocabulary knowledge and reading comprehension. One of those hypotheses, termed the instrumentalist hypothesis, is that knowing words directly facilitates text comprehension, that word knowledge is causally related to reading comprehension. Another, termed the aptitude hypothesis, is that vocabulary knowledge is simply an indication of intelligence and not a direct cause of reading comprehension. The third, termed the knowledge hypothesis, is that vocabulary is really a reflection of world knowledge and that it is this world knowledge rather than word knowledge that facilitates comprehension. Obviously, acceptance of one or another position about the relationship between words and thought or that between vocabulary knowledge and reading comprehension would result in distinct differences in what one does or does not do in teaching vocabulary in schools.

This leads to my more practical concern. It is my belief, and certainly that of others (for example, Becker, 1977; O'Rourke, 1974: and Stotsky, 1976), that although vocabulary development can be directly fostered in the schools, systematic vocabulary development, beyond the teaching of the relatively small reading vocabulary employed in primary grade basal readers, is not a part of

most school programs. Thus, while I am not immediately ready to accept Becker's recent (1977) argument that lack of vocabulary is one of the most potent factors affecting the school failure of disadvantaged students or his suggestion that school children should be taught the 7,000 word basic vocabulary identified by Dupuy (1974), Becker's case seems distinctly worth considering. But there is little current data which can help in assessing Becker's position because for the past two or three decades educational researchers have shown relatively little interest in the vocabularies of school age children.

In brief, I believe that knowledge about children's vocabularies is interesting and important and that such knowledge may lead to the construction of practical programs to be used in schools.

I turn now to consider what is certainly a preliminary study in this area but one which I have found informative and which I certainly hope you will find informative. As indicated in my title, the study attempts to investigate both quantitative and qualitative aspects of students' vocabularies. To do so, it employed two modes of data collection--paper and pencil group administered tests, and individual interviews.

The group test was designed to provide information on four questions: (1) To what extent do the reading

and listening vocabularies of good and poor readers differ? (2) To what extent do the vocabularies of better and poorer readers vary in size? (3, To what extent do the vocabularies of older and younger students vary in size? (4) How useful are certain word lists in scaling words for difficulty? The interview was designed to address three questions: (1) What procedures can be used to investigate qualitative aspects of children's vocabularies? (2) How valid and useful are the procedures used for investigating qualitative aspects of children's vocabularies? (3) How do students differ on certain tasks designed to measure qualitative aspects of their vocabularies?

Method

As already noted, the study was conducted in two phases. In the first phase, a group administered test was given. In the second phase, students were individually interviewed. In each of the sections that follow, the group testing is discussed first and the interview next.

Subjects

Subjects for the group test were 72 fourth grade students and 72 sixth grade students from a middle-class suburb of Minneapolis. The students were divided into equal size high, middle, and low ability groups based on teacher rankings. However, it should be noted that composite reading scores from the SRA Achievement Series (1973), which were obtained after the study had been conducted, indicated that the mean percentile ranks for the high, middle, and low ability groups were 84, 70, and 40 respectively. Moreover, only 10 of the 48 low ability students scored below the 25th percentile.

Subjects who were interviewed were two high ability students and two low ability students from each of grades three and five. The percentile ranks of the high ability third graders were 94 and 97, those of the low ability third graders were 9 and 32, those of the high ability fifth graders were both 87, and those of the low ability fifth graders were 28 and 32.

Materials

Materials for the group test consisted of two forms of a 36-item multiple-choice test and directions for giving the test. All of the words tested were nouns. Each item contained the word being tested in the stem and five alternatives, which were either individual words or phrases. In almost all cases, the relationship between the word being tested and the correct answer was one of synonymy. However, in a few cases, usually with very simple words, the correct answer described a function of the word being tested. The alternatives were designed to be distinctly wrong without being obviously incorrect and to be easier than the words being tested.

The words tested represented six different difficulty levels--pre-4th grade, 4th grade, 6th grade, 8th grade, 10th grade, and 12th grade. Difficulty levels of the words were established using the Harris-Jacobsen list (1972) and the Dale and O'Rourke list (1976). Pre-4th grade words appeared in the primer to 3rd grade core lists of Harris-Jacobsen and were correctly identified by over 90% of the 4th grade students tested by Dale and O'Rourke; 4th grade words appeared in the 4th or 5th grade core lists of Harris-Jacobsen and were identified as being at the 4th grade level by Dale and O'Rourke; 6th grade words appeared in the 6th grade core list or the 6th grade additional list of Harris-Jacobsen and were identified

as being at the 6th grade level by Dale and O'Rourke. And 8th, 10th, and 12th grade words were identified as being at those grade levels by Dale and O'Rourke. These more difficult words do not appear in the Harris-Jacobsen word list because their list goes only to the 6th grade level.

On the test the words were randomly ordered within six-word blocks such that within each block of six words, students received one word representing each level of difficulty. The same multiple-choice tests were used for both the reading and listening tasks.

There were four sets of directions. One set of directions was used for the reading task when it was presented first, and a shorter set of directions was used for the reading task when it was presented second. Similarly, one set of directions was used for the listening task when it was presented first, another set for the listening task when it was presented second. The directions were similar to those used with standardized, group-administered tests and included scripts for the examiner and sample items, which the students completed along with the examiner.

Materials for the interview consisted of four words at each of the six levels of difficulty described

above, directions for the interview, and 3 x 5 cards with the words or sentences containing the words printed on them.

The directions for the interview described three tasks, each of which students were asked to complete with one word at each level of difficulty. The students were first asked to give two meanings of a word. Next, they were asked to read two sentences, one of which used a word with one meaning and the other of which used it with another, and to explain the meaning of the word in each sentence. Finally, they were given two words with slightly different meanings and asked to explain the difference between the meanings.

Design and Analysis

The group test employed a 2 x 3 x 2 x 6 design with the variables being grade (4th, 6th), ability (high, middle, low), mode (reading, listening), and word difficulty (pre-4th, 4th, 6th, 8th, 10th, 12th), with repeated measures on the last two factors. The dependent measure was number correct on the multiple-choice test, which proved to have a reliability coefficient of .89 using the Spearman-Brown formula. This design was analyzed using the analysis of variance and Newman-Keuls procedures. The effects of two other variables,

test form and mode order, were counter balanced across each of the variables in the analysis.

The interview employed a 2 x 2 x 3 x 6 design with the variables being grade (3rd, 5th), ability (high, low), task (meanings in context, multiple meanings, precision of meaning), and word difficulty (pre-4th, 4th, 6th, 8th, 10th, and 12th), with repeated measures on the last two factors. The dependent measure was a score indicating performance on each of the three interview tasks. The scoring criteria are shown in Table 1 below. Two evaluators scored typed transcripts

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Insert Table 1 about here.

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of the interviews. Scores of the evaluators correlated at .96, and, in fact, scores of the two differed on only eight of the 172 responses scored. No statistical analysis was done on the interview results.

Procedure

The group test was administered to the students in their classrooms by two trained examiners. Half of the students received the reading task first and half received the listening task first, and half of the students received one form of the task first and half the other

first. Prior to whichever task the students received first, the examiner introduced himself or herself, read students the directions for the task, and lead the students through two sample items. Then, for students receiving the reading task first, the examiner read the number and the alternatives for each item, gave students time to mark the appropriate answer on their test booklets, and went on to the next item. For students receiving the listening task, the examiner read the number of each item, the word being tested, and the alternatives for each item, gave students time to mark the appropriate answer on their test booklets, and went on to the next item. Thus, for both the reading and listening tasks the students were paced through the items as a group, and for both tasks the alternatives were read to students. Immediately after being given the first task, students were given brief directions for the second task, lead through one sample item and given the second task. The entire test took about 30 minutes. Finally, students were thanked for their participation and went back to their regular classwork.

The interviews were administered by the same examiners who did the group testing and took place a week after the group testing. Students were interviewed

in small offices at the school and their responses tape recorded. After introducing himself or herself and telling students that they were going to be asked some questions about some words, the examiner went through the following procedures with a set of words representing each of the six levels of difficulty.

For the multiple-meanings task, first, the student was shown a word and asked, "Can you read this word?" If he or she could not, the word was read to the student. Next, the student was asked, "Can you tell me what it means?" If the student gave one meaning, he or she was then asked, "Can you tell me another meaning it has?"

For the meanings in context task, the student was first shown a word and asked, "Can you read this word?" If he or she could not, the word was read to the student. Next the student was shown the word in a sentence and asked, "Can you read this sentence?" If he or she could not, the sentence was read to the student. Then, the student was asked what the word meant in that sentence. Finally, the student was given a sentence which used the word with a different meaning and asked what it meant in that sentence.

For the precision of meaning task, the student was first shown two words and asked, "Can you read these

words?" If he or she could not, they were read to the student. Then, the student was asked to explain the difference between the two words. Finally, this task was repeated with another set of two words.

Throughout the interview, the examiners attempted to be supportive, friendly, and encouraging, but they did not probe or prompt the students. The interviews were terminated if a student could complete none of the tasks at a particular level of difficulty. The interviews took about 15 to 30 minutes.

Results

As was the case in the methodology section, in this section the results of the group test are presented first and the results of the interview next.

The mean percentage of correct responses for each condition of grade, ability, mode, and word difficulty are shown in Table 2 below. As can be seen from the

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Insert Table 2 about here.

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table, sixth graders scored higher than fourth graders, students scored higher in the listening mode than in the reading mode, students in each successive ability group scored higher than those in lower groups, and students scored higher on each successively easier group of words. The analysis of variance, which is shown in Table 3, indicated that each of these main effects is

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Insert Table 3 about here.

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significant at $p<.001$. The Newman-Keuls test indicated that all of the contrasts between ability groups were significant at $p<.01$. The Newman-Keuls test also indicated that all of the differences between levels of word difficulty except those between pre-4th and

4th and between 10th and 12th were significant at $p<.01$ or $p<.05$.

The analysis of variance also indicated two significant interactions, both of which were significant at $p<.001$. The first of these, a grade x difficulty interaction, is shown in Table 4. As shown in the

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Insert Table 4 about here.

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table, sixth graders and fourth graders score about the same on pre-4th and 4th grade words. However, on more difficult words the sixth graders score considerably higher than the fourth graders. The second interaction, an ability x difficulty interaction, is shown in Table 5.

Insert Table 5 about here.

As can be seen from the table, this interaction is quite similar to that between grade and ability but even stronger. Students of all ability levels do well on pre-4th and 4th grade words. However, high ability students score markedly better than low ability students and considerably better than middle ability students on the more difficult words. I will comment further on these differences in the discussion. Before that, however, I will briefly present the interview results.

Table 6 shows the mean percentages of the scores possible for each condition of grade, ability, task, and word difficulty in the interview. That is, the table shows the percentage correct out of a possible percentage of 100 for each of the levels of each of the main effects. As can be seen from the

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Insert Table 6 about here.

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table, fifth graders did markedly better than third graders, high ability students did better than low ability students but not dramatically better, students did best at the meanings in context task and poorest at the precision of meaning task, and the words seem to cluster into three levels of difficulty--pre-4th and 4th, 6th and 8th, and 10th and 12th.

Since there was no statistical analysis of the interview results, there can, of course, be no statistically significant interactions. There was, however, one quite strong interaction that appears worth noting. This is the ability x task interaction, which appears in Table 7. As can be seen from the table, high ability

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Insert Table 7 about here.

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students scored markedly higher than low ability students on the multiple meanings task; in fact, the high ability

students' score on this task was nearly twice that of the low ability students. However, on the other two tasks the high ability students scored only about 15% higher than the low ability students.

Discussion

As was the case in previous sections, in this section the results of the group test will be discussed first and those of the interview next. In this discussion, I will attempt to provide brief answers to the questions posed in the introduction.

The first, and in some ways most important, question posed was that of to what extent the listening and reading vocabularies of good and poor fourth and sixth grade readers varied. The answer is very little; in fact, there is almost no difference, even for the low ability fourth graders. For the group tested at least (and again I emphasize that they are an above average group with very few students at extremely low levels of performance), decoding does not appear to be a problem. If some of the students tested do have reading problems, and their teachers certainly believe that some of them do, the locus of the problems do not appear to be in their inability to decode.

The second question was that of to what extent the vocabularies of high, middle, and low ability readers vary in size. The general answer is that they vary quite a bit, with, of course, both middle and low

ability readers' vocabularies being smaller than those of high ability readers and with low ability readers' vocabularies being markedly smaller than middle ability readers'. However, this general answer needs to be qualified. Students of all ability levels appear to know the vast majority of easy words. But as words become more difficult, the number of words known by low ability readers drops radically faster than the number known by high ability readers and a good deal faster than the number known by middle ability readers. For example, the high ability readers' scores on 10th and 12th grade level words were over 50% better than those of low ability readers on those words. Lack of vocabulary, then, appears to be part of low ability readers' problem.

The third question was that of to what extent the vocabularies of fourth and sixth grade students vary in size. The general answer is that they differ by a fair amount, although this difference is not as great as that between low and high ability readers. Again, though, this answer needs to be qualified. Both fourth and sixth graders appear to know the vast majority of easy words. But as words become more difficult, the number of words known by fourth grade readers drops off considerably faster than does the number known by

sixth grade students. Of course, these effects of grade are to be expected and do not indicate a problem.

The last question posed with the group test was that of the utility of the Harris-Jacobson list and the Dale and O'Rourke list in scaling words for difficulty. Briefly, these lists and the procedures we used with them seem to be quite useful in scaling words for difficulty. They are, for example, radically better predictors of word difficulty than a study we recently completed found word frequency to be (Graves, Boettcher, Peacock, & Ryder, in press). And I would recommend both lists for both instructional and research purposes.

As previously noted, the interview was designed to investigate three questions. The study provided only one of many pieces of information that will be needed to answer the first question, that of what procedures can be used to investigate qualitative aspects of students' vocabularies, and an answer to that question is therefore not yet available. Somewhat similarly, the answer to the second question, that of the validity and utility of the three tasks used for investigating qualitative aspects of children's vocabularies, must await further study. While I am not aware of any glaring problems with the tasks, I need to study the transcripts more

closely than I have so far and interview more and more diverse children before deciding on their validity and utility. At the same time the fact that the effects of grade, ability, and word difficulty came out as one would expect provides some support for the tasks.

Thus, the answer to the third question, that of how kids differ at the three tasks seems worth considering but must be considered as tentative. Students did markedly better with the meanings in context task than with the other two tasks, and they did somewhat better at the multiple meanings task than the precision of meanings task. Among other things, this means that students can and do use sentence context in arriving at the appropriate meaning of polysemous words, at least when they are asked to do so with sentences in isolation. This is certainly predictable. However, the results when performance of high and low ability students' are considered separately are less predictable. For the low ability students were nearly as adept at determining meanings in context as their high ability counterparts, but they were radically poorer than the high ability students at producing multiple meanings when the words were out of context. This suggests that poorer readers' word knowledge skills are more retarded than their use of context skills,

a finding that appears to be contrary to the prediction one would make based on Smith's (1978) or Goodman's (1970) theory and which would seem to argue for the importance of word knowledge.

There is a good deal more that could be said about the study, but for now I will only conclude by saying that at the end of the study as at the beginning of it, I find the question of vocabulary knowledge to be both interesting and potentially important to instruction.

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Sample Items from Group Test

1. sandal

   A. grown man

   B. big cake

   C. open shoe

   D. good actress

   E. small car

4. currency

   A. hazard

   B. money

   C. arrogance

   D. polo

   E. rubbish

Sample Items from Interview

Pre-Fourth Items

Task 1: foot

Task 2: bridge

The bridge had been washed out.

Do you like to play bridge?

Task 3: jungle forest

bowl dish

Fourth Items

Task 1: file

Task 2: smack

Julie gave her dad a smack on the lips.

Bruce gave Todd a smack on the back.

Task 3: mansion house

twig limb

Table 1

Scoring Criteria for Interview Tasks

Multiple Meaning Task	Produced no meanings----------0
	Produced one clear meaning------1
	Produced two clear meanings-----2
Meanings in Context Areas	Chose no appropriate meanings---0
	Chose one appropriate meaning---1
	Chose two appropriate meanings--2
Precision of Meaning Task	Gave no distinction----------0
	Gave a hazy distinction---------1
	Gave a clear distinction--------2

Table 2

Mean Percentage of Correct Responses for Each Condition of Grade, Ability, Mode, and Word Difficulty on the Group Test

Grade	Sixth	78%	Fourth	68%		
Ability	High	80%	Middle	75%	Low	65%
Mode	Listening	75%	Reading	72%		
Word Difficulty	Pre-4th	99.7%	4th	97%	6th	83%
	8th	66%	10th	48%	12th	46%

Table 3

Analysis of Variance for Group Test

Source of Variation	Sum of Squares	df	Mean Square	F	p
Grade (G)	144.09	1	144.09	62.93	.001
Ability (A)	230.82	2	115.41	50.40	.001
G x A	1.54	2	.77	.34	.713
Error	315.98	138	2.28		
Mode (M)	10.54	1	10.54	12.96	.001
M x G	.09	1	.09	.12	.729
M x A	.44	2	.22	.27	.763
M x G x A	.19	2	.09	.12	.887
Error	112.30	138	.81		
Difficulty (D)	2911.79	5	582.35	747.07	.001
D x G	57.10	5	11.42	14.65	.001
D x A	104.78	10	10.47	13.44	.001
D x G x A	9.35	10	.93	1.20	.287
Error	537.87	690	.77		
M x D	8.26	5	1.65	1.52	.181
M x D x G	3.35	5	.67	.62	.687
M x D x A	10.06	10	1.00	.93	.509
M x D x G x A	3.00	10	.30	.28	.986
Error	750.21	690	1.08		

Table 4

Percentages of Correct Responses

for Grade x Difficulty Interaction

Word Difficulty	Grade	
	Sixth	Fourth
Pre-4th	99.8%	99.7%
4th	98.5%	95.9%
6th	89.5%	76.9%
8th	73.3%	58.0%
10th	55.6%	31.1%
12th	52.1%	40.3%

Table 5

Percentages of Correct Responses
for Ability x Difficulty Interaction

Word Difficulty	Ability		
	High	Middle	Low
Pre-4th	99.7%	99.8%	99.7%
4th	98.1%	98.4%	95.1%
6th	92.0%	85.4%	72.0%
8th	78.3%	67.4%	51.2%
10th	59.0%	49.0%	35.9%
12th	53.6%	47.4%	37.7%

Table 6

Mean Percentages of Possible Scores for Each Condition of Grade, Ability, Task and Word Difficulty in the Interview

Grade	Fifth	64%		Third	35%	
Ability	High	56%		Low	43%	
Task	Meanings in Context	69%	Multiple Meanings	43%	Precision of Meaning	35%
Word Difficulty	Pre-4th	78%	Fourth	81%	Sixth	47%
	Eighth	48%	Tenth	22%	Twelfth	20%

Table 7

Mean Percentages of Possible Scores

for Ability x Task Interaction

Ability	Task		
	Multiple Meanings	Meanings in Context	Precision of Meaning
High	56%	73%	38%
Low	31%	65%	33%